

PCT

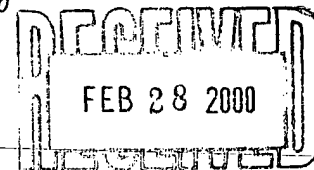
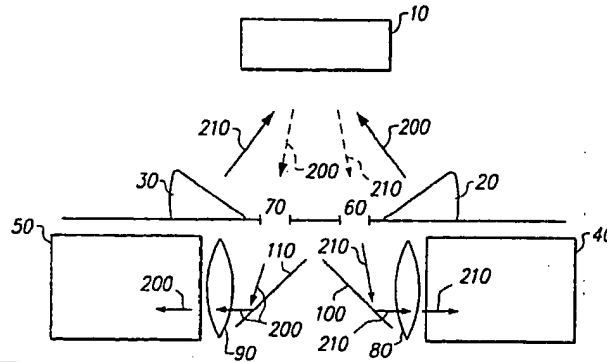
WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>G02B 27/22, 26/08</b>		<b>A3</b>	(11) International Publication Number: <b>WO 99/63388</b>
			(43) International Publication Date: 9 December 1999 (09.12.99)
(21) International Application Number: PCT/US99/12193		(81) Designated States: AL, AM, AU, BB, BG, BR, CA, CN, CZ, EE, ES, FI, GE, HU, IS, JP, KG, KP, KR, LK, LR, LT, LV, MD, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, TR, TT, UA, UZ, VN, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 1 June 1999 (01.06.99)			
(30) Priority Data: 09/092,245 5 June 1998 (05.06.98) US			
(71) Applicant: SILICON LIGHT MACHINES [US/US]; Suite 115, 385 Moffett Park Drive, Sunnyvale, CA 94089 (US).			
(72) Inventor: CORBIN, Dave, B.; 26950 Orchard Hill Lane, Los Altos Hills, CA 94022 (US).			
(74) Agents: HAVERSTOCK, Thomas, B. et al.; Haverstock & Owens LLP, Suite 420, 260 Sheridan Avenue, Palo Alto, CA 94306 (US).			
		Published With international search report.	
		(88) Date of publication of the international search report: 10 February 2000 (10.02.00)	

(54) Title: STEREO HEAD MOUNTED DISPLAY USING A SINGLE DISPLAY DEVICE



(57) Abstract

A single display device (10) is mounted within a head-worn apparatus to produce both a left image and a right image. The left image is directed to a right eye of the user, and the right image is directed to the left eye of the user. When in the stereoscopic mode, the right and left images differ from each other such that when viewed by the user, the combined right and left images give the user a stereoscopic, three-dimensional effect. When worn on the head of the user, the device is properly aligned to provide the left image to the right eye and the right image to the left eye. Further, as the user moves, the present invention remains properly aligned such that the user can continue viewing the left image with the right eye and the right image with the left eye independent of movement by the user so long as the user keeps wearing the device. A plurality of pixels are collected as the display (10), wherein each pixel is formed of a grating light valve. The modulation of light by the grating light valve is configured to be accomplished sequentially and also sufficiently fast to multiplex both complete right and left images in a single time frame thereby preventing flicker. By using a single display, the device is inherently aligned to produce accurate right and left images viewed by each respective eye without internal adjustments. Further, by using the grating light valve, the user is only exposed to reflected light rather than to harmful radiation such as from a cathode ray tube. Additionally, forming the display of grating light valves allows formation of two images without the use of any filters owing to the speed of grating light valves.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakhstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 99/12193

## A. CLASSIFICATION OF SUBJECT MATTER

G02B27/22, G02B26/08

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G02B, H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2296152 A (GEC-MARCONI AVIONICS LTD.) 15 June 1996, page 2, line 16 - page 4, line 17, page 6, line 20 - page 10, line 16.	1, 5, 6
A		2, 7, 10-13, 15-19, 22, 23, 25, 26, 28, 29
Y	GB 2319424 A (DAEWOO ELECTRONICS CO. LTD.) 20 May 1998, fig. 4, 5, 7, page 5, line 14 - page 6, line 11, page 7, line 21 - page 8, line 16.	1, 5, 6

☒ Further documents are listed in the continuation of box C.

☐ Patent family members are listed in annex.

### \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

\*&\* document member of the same patent family

Date of the actual completion of the international search

24 September 1999

Date of mailing of the international search report

22 11. 1999

Name and mailing address of the ISA

European Patent Office, P.O. 5818 Patentaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tlx. 31 651 epo nl.

Authorized officer

GRONAU e.h.

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	--	7, 10, 15, 16
A	WO 94/29761 A (A.T.M.A.S.R.L.) 22 December 1994, fig. 1-4, 8.	1, 5, 7, 10, 15, 16, 22, 28
A	WO 97/22033 A (STREET, G.S.B.) 19 June 1997, abstract, page 8, line 15 - page 12, line 9, page 13, line 28 - page 14, line 9.	1, 5, 7, 10, 15, 16, 22, 28
A, P	WO 98/41893 A (SILICON LIGHT MACHINES, INC.) 24 September 1998, fig. 4, 5, 8, 8A, 9-11, 18, page 18, lines 7-12 (cited in the application).	1-4, 6, 7-9, 11, 15, 17, 22- 24, 25, 26, 28, 29
	----	

# ANHANG

zum internationalen Recherchen-  
bericht über die internationale  
Patentanmeldung Nr.

# ANNEX

to the International Search  
Report to the International Patent  
Application No.

# ANNEXE

au rapport de recherche inter-  
national relatif à la demande de brevet  
international n°

PCT/US 99/12193 SAE 239316

In diesem Anhang sind die Mitglieder  
der Patentfamilien der im obenge-  
nannten internationalen Recherchenbericht  
angeführten Patentdokumente angegeben.  
Diese Angaben dienen nur zur Unter-  
richtung und erfolgen ohne Gewähr.

This Annex lists the patent family  
members relating to the patent documents  
cited in the above-mentioned inter-  
national search report. The Office is  
in no way liable for these particulars  
which are given merely for the purpose  
of information.

La présente annexe indique les  
membres de la famille de brevets  
relatifs aux documents de brevets cités  
dans le rapport de recherche inter-  
national visé ci-dessus. Les renseigne-  
ments fournis sont donnés à titre indica-  
tif et n'engagent pas la responsabilité  
de l'Office.

Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
GB A1 2296152	19-06-1996	GB A0 9425119 GB A0 9501855 GB B2 2296152	15-02-1995 22-03-1995 07-07-1999
GB A1 2319424	20-05-1998	GB A0 9703963 JP A2 10148789 SG A1 54472 US A 5806802	16-04-1997 02-06-1998 16-11-1998 15-09-1998
WD A1 9429761	22-12-1994	keine - none - rien	
WD A1 9722033	19-06-1997	AU A1 10387/97 DE C0 69603374 EP A1 865626 EP B1 865626 GB A0 9526672 US A 5936774 GB A0 9525222 US A 5712732 WD A2 9420875 WD A3 9420875 EP A1 687366 GB A0 9400097 GB A0 9324141 GB A0 9322579 GB A0 9312419 GB A0 9307638 GB A0 9304279	03-07-1997 26-08-1999 23-09-1998 21-07-1999 28-02-1996 10-08-1999 07-02-1996 27-01-1998 15-09-1994 12-01-1995 20-12-1995 02-03-1994 12-01-1994 22-12-1993 25-08-1993 02-06-1993 21-04-1993
WD A1 9841893	24-09-1998	AU A1 65690/98	12-10-1998

**THIS PAGE BLANK (USPTO)**